

Mycetobia and the Classification of the Diptera.

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In a paper read at the ninth annual meeting of the Entomological Society of America, the writer proposed a new grouping of the lower families of Diptera, generally called Nematocera, dividing them into two series according to the character of the larval respiratory system.¹ In one series, Oligoneura, were placed those forms in which the larvæ showed the more primitive condition of a series of lateral spiracles, such as occurs in most terrestrial insects. In the other series, Polyneura, were grouped those forms in which the larval respiratory system had become profoundly modified in adaptation to aquatic life, a single pair of large functional spiracles occurring posteriorly. The grouping thus brought about appeared more natural also when the adult characters were considered.

In examining the available data concerning the larval spiracles, but one seeming contradiction was found. This was the genus *Mycetobia*, universally considered a member of the family Mycetophilidæ. Its larva was said to differ from all the others of that family by possessing but a single pair of spiracles, posteriorly situated, and showing a remarkable resemblance to the Rhyphidæ. This contradiction within a large and otherwise homogeneous group was already strongly felt by Osten Sacken.² He accepted the statements of three most careful workers,—Lyonet, Dufour and Perris—all agreeing on this point, but ended the discussion of the subject with the remark, "this is a problem yet to solve." The writer, finding *Mycetobia* the only case conflicting with his proposed grouping, became convinced that some error existed and suggested that the three great observers just mentioned might after all have been mistaken. It has now been made clear that they were correct, but the seeming contradiction has been explained in an unexpected manner, most gratifying from the view-point of the writer's ideas.

¹ The Nematocera not a natural group of Diptera. Ann. Ent. Soc. Amer., vol. 8, 1915, pp. 93-98.

² Berlin. Entom. Zeitschr., vol. 37, 1892, pp. 442-443.

Mons. D. Keilin of Paris, a careful student of dipterous larvæ, becoming interested in the question at issue, reinvestigated the larva of *Mycetobia*, and determined that the correspondence with *Rhyphus* is even closer than had been supposed. Evidently his suspicions were aroused that *Mycetobia* had been wrongly placed with the Mycetophilidæ, for he now suggested to Mr. F. W. Edwards of the British Museum an investigation of the imagos. The result of Mr. Edwards' study have appeared recently and tend to show that *Mycetobia* does not belong to the Mycetophilidæ, but to the Rhyphidæ, as was indicated by the larval characters.³ For the detailed discussion of the characters upon which *Mycetobia* is referred to the Rhyphidæ, the reader must consult Mr. Edwards' original paper. As this will not be generally accessible, the importance of the subject leads me to quote what he has to say regarding the wing-venation:

The Rhyphidæ and Mycetophilidæ agree in having a costa which does not extend beyond the tip of the wing, but differ widely in that the former have a three-branched media and a discal cell, whereas the latter never have more than a two-branched media and no discal cell.

At first sight it is not easy to connect the two types, but if in the wing of *Rhyphus* we suppress the third branch of the media, and with it the cross-vein forming the discal cell, a condition very much resembling that of *Mycetobia* is arrived at, and the following points of resemblance between the two genera become more apparent:—(1) the

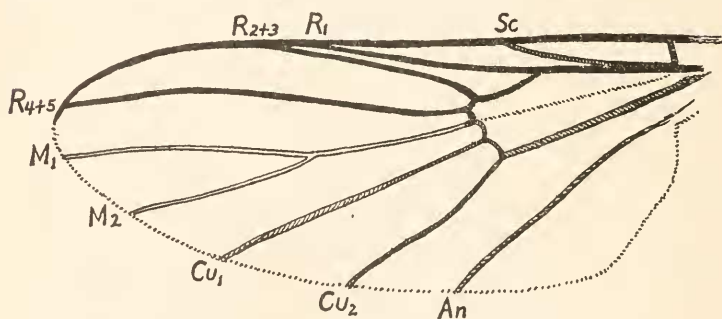


Fig. 1. *Mycetobia*, venation.

³ On the systematic position of the genus *Mycetobia*, Mg. Ann. Mag. Nat. Hist., 8 Ser., vol. 17, no. 97, Jan. 1916, pp. 108-116.

radial sector forks basally to the R-M cross-vein, or, in other words, the small cross-vein is situated on the third longitudinal vein, instead of on the præfurca; (2) the lower branch of the cubitus is distinctly sinuous, the cell Cu_1 having a convexity on the lower side towards the base. The resemblance between the venation of *Myceto-*

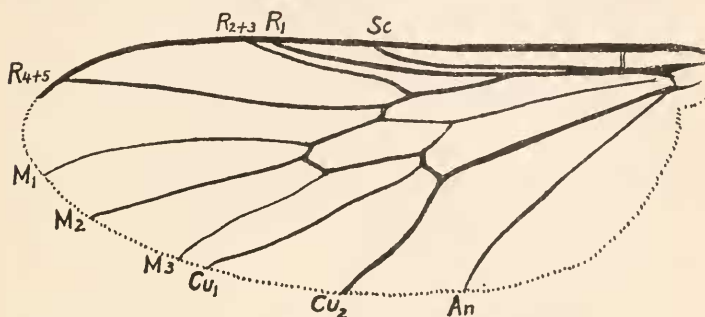


Fig. 2. *Olbiogaster*, venation.

bia (fig. 1) and *Olbiogaster* (fig. 2) is in some respects still more marked, and it is worthy of particular notice that in *Olbiogaster africanus* Edw., and still more conspicuously in *O. sackeni* Edw., the lowest of the three veins arising from the discal cell (M_3) is less strongly chitinized than the other two, suggesting that the venation of *Mycetobia* has arisen directly from that of *Olbiogaster* through the obsolescence of M_3 .

In almost all other Mycetophilidæ the radial sector, when it forks at all, does so nearer the wing-apex than the position of the R-M cross-vein, which, besides, is usually sloping, and not straight as it is in *Mycetobia*. The only exception to this rule is the genus *Pachyneura*, in which the radial sector forks exactly at the R-M cross-vein. In all other Mycetophilidæ, with the exception of *Leiomyia* (*Glaphyoptera*) and its allies, the cell Cu_1 is concave instead of convex on its lower margin. *Ditomyia* and *Symmerus*, genera which, together with *Mycetobia*, have been made to form the subfamily Mycetobiinae, agree in both these respects with the other Mycetophilidæ, and I therefore consider that they are not at all closely related to *Mycetobia*. The genus *Mesochria*, recently described from the Seychelles Islands, is, on the other hand, closely related to *Mycetobia*. Its venation is very interesting, as the media is evanescent; it evidently represents a further stage of evolution from *Mycetobia*, in which the lowest branch of the originally three-branched media has already disappeared.

A comparison with other Diptera as regards the position of the radial fork reveals the fact that in the Tipulidæ, Culicidæ, Psychodidæ, Orthorrhapha Brachycera, and Cyclorrhapha, it always takes place

anteriorly to the R-M cross-vein, whereas in the Chironomidæ, Simulidæ, and Bibionidæ the radial sector is usually simple, but when it forks does so beyond the R-M cross-vein. An apparent exception to this rule, however, is the Bibionid genus *Eupeitenus*. It is also noteworthy that in the families of the first group the media is primitively three-branched, while in those of the second it is never more than two-branched.

Mr. Edwards disclaims having made an exhaustive investigation, but expresses the conviction that *Mycetobia* belongs with the Rhyphidæ. The writer hopes that other workers will be stimulated to take up the study of the relationships within the Diptera, and their bearings on the new ideas. With this end in view, I quote the summary at the end of Mr. Edwards' paper:

1. *Mycetobia* agrees with the Rhyphidæ and diverges from the Mycetophilidæ in the possession of a large gular plate, in the structure of the second palpal joint, in the position of the forking of the radial vein, the course of the cubital vein, and in the chitinous spermatheca of the female. Since the venation of *Mycetobia* has been shown to be directly derivable from that of the Rhyphid genus *Olbiogaster*, it is probable that any resemblances in this respect to the Mycetophilidæ are due to convergent evolution, and not to relationship. The genus *Mycetobia* (and with it *Mesochria*, though not *Ditomyia* or *Symmerus*) must therefore, on grounds of adult as well as larval structure, be transferred from the Mycetophilidæ to the Rhyphidæ.

2. It is at least possible that the characters of the gular plate and of the position of the radial fork will be found on full investigation to divide the Nematocera into two groups, and there is evidence that these groups may coincide with those founded on other characters, notably the tracheal system of the larva; this evidence, therefore, tends to confirm Knab's recent division of the Nematocera (Ann. Ent. Soc. Amer. vol. viii, p. 93, March, 1915) into Oligoneura, with peripneustic larvae, and Polyneura, with amphipneustic larvae. The genus *Pachyneura* seems to require special study, owing to the intermediate character of its venation, and *Eupeitenus* is also aberrant.

3. If, as seems probable from many considerations, the higher Diptera have been derived from the Polyneura and the Oligoneura represent an entirely distinct line of evolution, the primary division of the order should be neither into Orthorrhapha and Cyclorrhapha, nor into Nematocera and Brachycera, but into Polyneura and Oligoneura, the former including, in addition to the Tipulid-Culicid group of the Nematocera, the whole of the Cyclorrhapha and the Orthorrhapha Brachycera.